DUAL 150MA HIGH PERFORMANCE MOBILE LDO™ IN USP6

FSP2151

■ FEATURES

- 180mV Typical Dropout with 150mA Load
- ±2.0% Voltage Accuracy
- High PSRR: 70dB@100Hz
- Low noise output
- Current Limit
- Thermal Shutdown Protection
- Short Circuit Protection
- Very small USP6 Package

■ APPLICATIONS

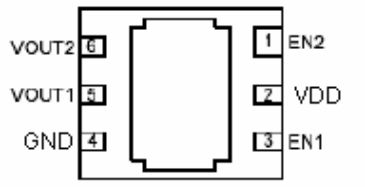
- Cellular Handsets
- Portable Electronics, PDA
- Wireless Devices, LAN
- Computer Peripherals
- Camera Module
- GPS Receiver

■ GENERAL DESCRIPTION

The dual LDO FSP2151 series of positive voltage linear regulators feature high output voltage accuracy, low quiescent current and low dropout voltage, making them ideal for battery powered applications. The line transient response and load transient response are excellent. Their high PSRR make them useful in applications where AC noise on the input power supply must be suppressed. Space-saving USP6 package for 2ch LDOs is attractive for portable and handheld applications. They have both thermal shutdown and a current limit feature to prevent device failure under extreme operating conditions. They are stable with an output capacitance of 2.2uF or greater.

■ PIN CONFIGURATION

(Bottom View)



■ PIN DESCRIPTION

Pin Number	Pin Name	Pin Function
1	EN2	Enable pin for LDO2. Connect EN2 to IN or to a logic high for normal operation, drive EN2 to G or a logic low to disable the regulator. Do not leave EN2 floating.
2	VDD	Input Voltage. Bypass this pin with a 1μF capacitor connected to G, placed as close to the IC as possible.
3	EN1	Enable pin for LDO1. Connect EN1 to IN or to a logic high for normal operation, drive EN1 to G or a logic low to disable the regulator. Do not leave EN1 floating.
4	GND	Ground.
5	VOUT1	LDO1 Output. Bypass this pin with a 1μF capacitor connected to G. OUT1 is actively discharged to G through 800Ω when disabled.
6	VOUT2	LDO2 Output. Bypass this pin with a 1μF capacitor connect to G. OUT2 is actively discharged to G through 800Ω when disabled.

■ ABSOLUTE MAXIMUM RATINGS

Parameter	Rating	Unit
Input Voltage	6	V
Output Pin Voltage	GND-0.3 to VIN + 0.3	V
Output Current	150/150	mA
Internal Power Dissipation)	100	mW
ESD Rating(HBM)	2000	V
Operating Junction Temperature	-40 to 125	°C
Operating Ambient Temperature	-40 to 85	°C
Storage Temperature	-40 to 125	°C
Lead Temperature (Soldering, 5 sec)	300	°C

Note: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired

■ ELECTRICAL CHARACTERISTICS

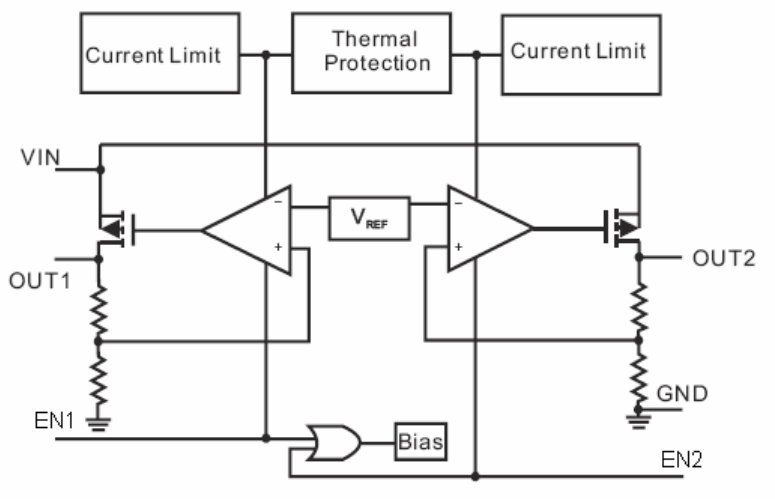
(V_{IN} = V_{OUT} + 1V, EN1 =EN2= IN, C_{IN} = 2.2F, C_{OUT} = 2.2F, T_A= 25°C unless otherwise specified.)

Parameter	Test Conditions		Min	Typ	Max	Unit
Input Supply Range			Note 1		5.5	V
EN Input Voltage			0		VIN	V
Output Voltage Accuracy	I_O=1mA		-2.0		+2.0	%
Output Current			150		Note 2	mA
Quiescent Current	I_O=0mA			175	250	μA
Shutdown Supply Current	Both outputs disabled			0.1	1	μA
Short Circuit Current	V_O= 0V			150		mA
Ground Pin Current	I_O=0mA to 150mA			200	250	μA
Line Regulation	I_O=50mA V_{IN} = 3.0V to 4.0V	V_O= 1.8V	-0.15	0.1	0.15	%/V
	I_O=50mA V_{IN} = 3.5V to 4.5V	V_O= 2.5				
	I_O=50mA V_{IN} = 3.8V to 4.8V	V_O= 2.8V				
Load Regulation	I_{OUT} = 1mA to 150mA V_{IN}= 3.3V		-2	1.0	2	%/mA
Power Supply Ripple Rejection	I_O=50mA V_O = 1.8V	f= 100Hz		70		dB
		f= 1KHz		63		
		f= 10KHz		45		
Dropout Voltage	V_{OUT} = 1.8V, I_{OUT} = 150mA			950		mV
	V_{OUT} = 2.5V, I_{OUT} = 150mA			350		
	V_{OUT} = 2.8V, I_{OUT} = 150mA			180		
Current Limit	V_{OUT} ≥1.2V			200		mA
Output Noise	f= 10Hz to 100KHz			35		uVrms
Over Temperature Hystersis	I_O=1mA			40		°C
Over Temperature Shutdown	I_O=1mA			155		°C
EN_ Logic Low Threshold					0.3	V
EN_ Logic High Threshold			1.5			V
EN Pull-up Resistance			1.7	5	15	mΩ
Temperature Coefficient				40		ppm/°C

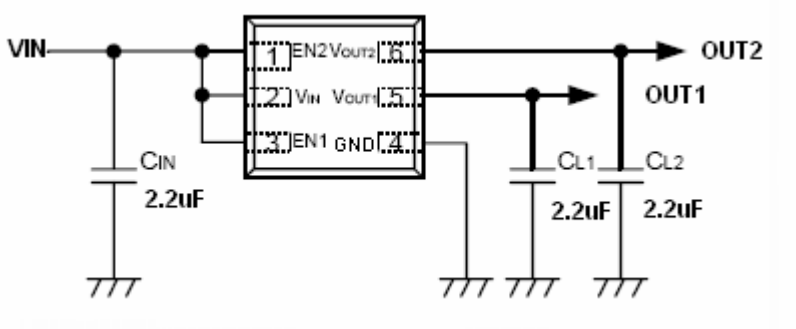
Note 1：The minimum input voltage of the FSP2151 is determined by output voltage and dropout voltage. The minimum input voltage is defined as:
$V_{IN(MIN)}$=V_O+V_{DROP}

Note 2: Output current is limited by P_D, maximum I_O=P_D/($V_{IN(MAX)}$-V_O)

■ FUNCTIONAL BLOCK DIAGRAM



■ TYPICAL APPLICATION CIRCUIT



■ APPLICATION INFORMATION

Capacitor Selection and Regulator Stability

Similar to any low dropout regulator, the external capacitors used with the FSP2151 must be carefully selected for regulator stability and performance.

Using a capacitor, C_{IN}, whose value is > 2.2 μF at the FSP2151 input pin, the amount of the capacitance can be increased without limit. Please note that the distance between C_{IN} and the input pin of the FSP2151 should not exceed 0.5 inch. Ceramic capacitors are suitable for the FSP2151. Capacitors with larger values and lower ESR provide better PSRR and line-transient response.

The FSP2151 is designed specifically to work with low ESR ceramic output capacitors in order to save space and improve performance. Using an output ceramic capacitor whose value is > 2.2 μF with ESR > 5mΩ ensure stability.

Shutdown Input Operation

The FSP2151 is shutdown by pulling the EN input low, and is turned on by tying the EN input to VIN or leaving the EN input floating.

Dropout Voltage

A regulator's minimum dropout voltage determines the lowest usable supply voltage. The FSP2151 has a typical 180mV dropout voltage. In battery powered systems, this will determine the useful end-of-life battery voltage.

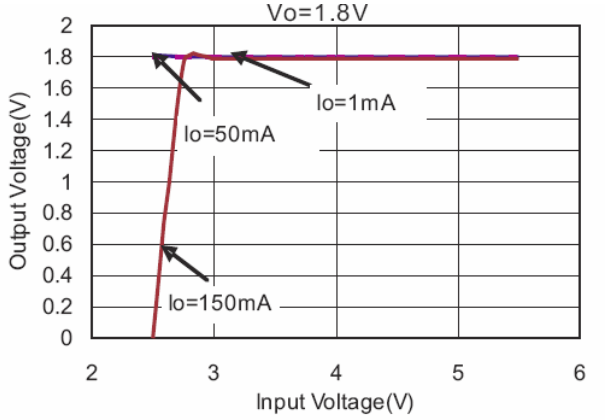
Current Limit and Short Circuit Protection

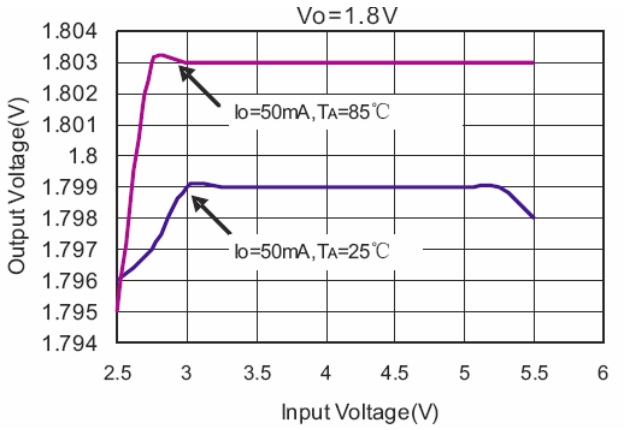
The FSP2151 features a current limit, which monitors and controls the gate voltage of the pass transistor. The output current can be limited to 300mA by regulating the gate voltage. The FSP2151 also has a built-in short circuit current limit.

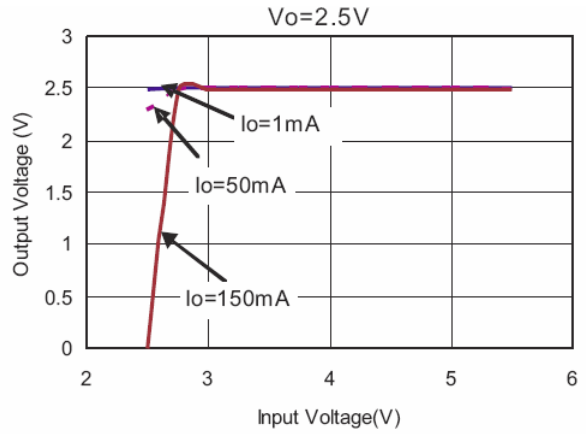
■ TYPICAL PERFORMANCE CHARACTERISTICS

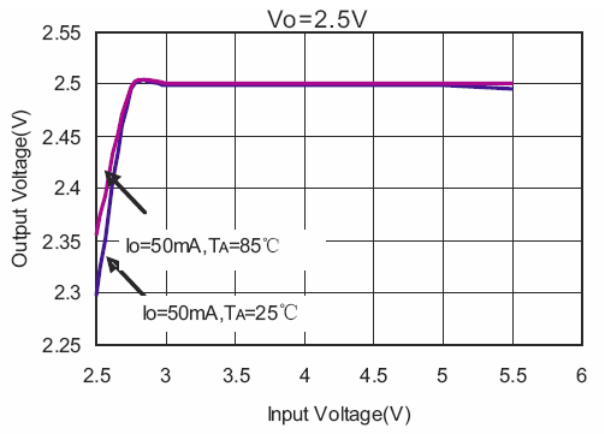
(C_{IN} = 2.2uF, C_O = 2.2uF, T_A = 25°C unless otherwise specified.)

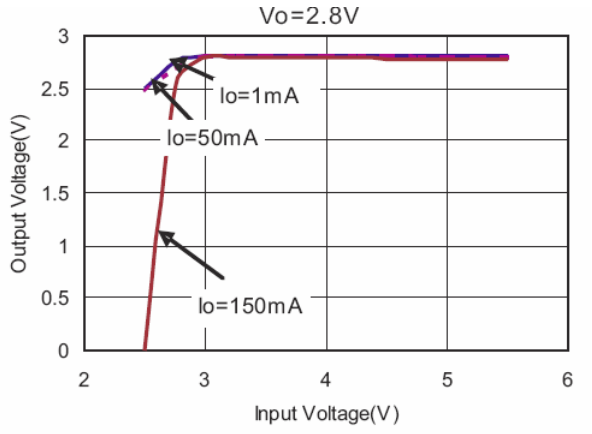
Output Voltage vs Input Voltage

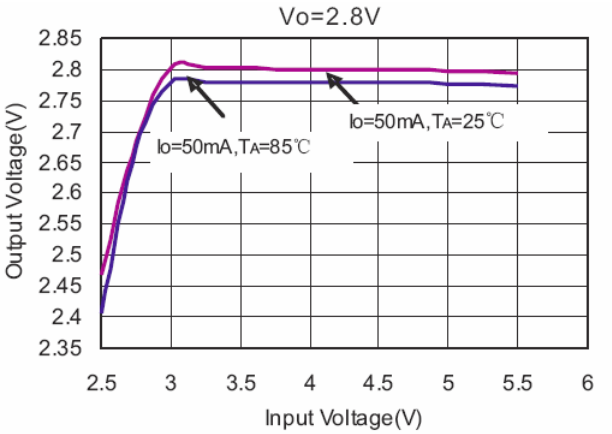








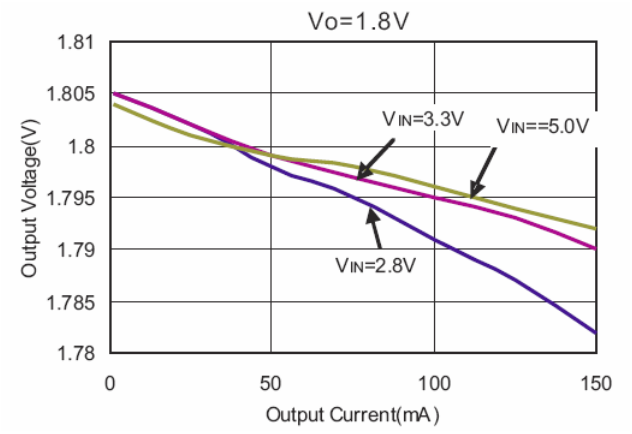




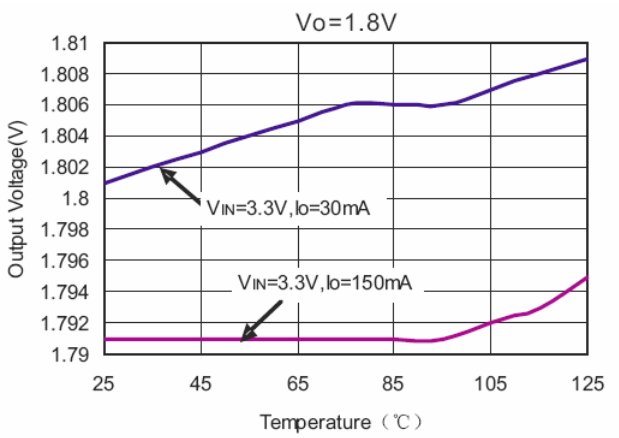
■ TYPICAL PERFORMANCE CHARACTERISTICS（CONTINUED）

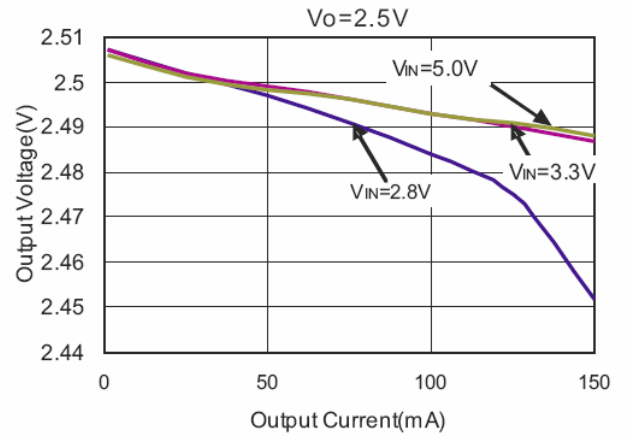
(C_{IN} = 2.2uF, C_O = 2.2uF, T_A = 25°C unless otherwise specified.)

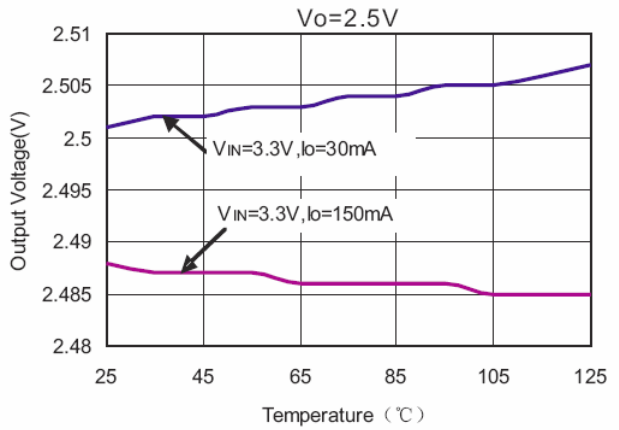
Output Voltage vs Output Current

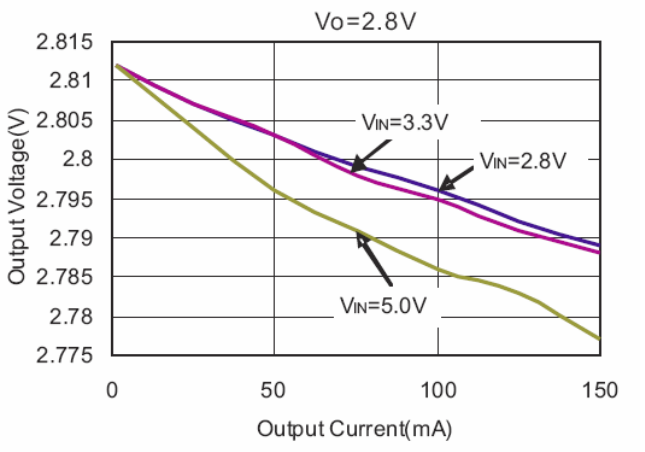


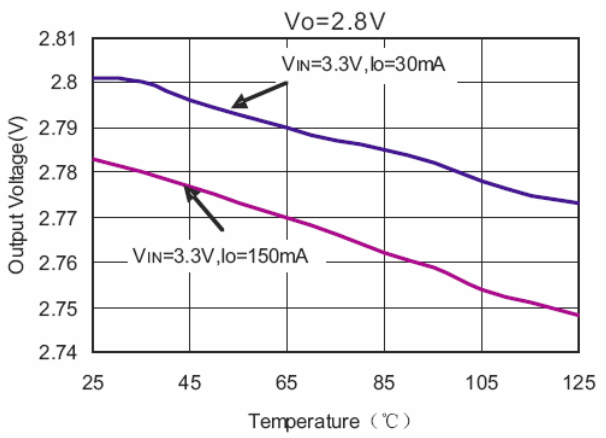
Output Voltage vs Temperature







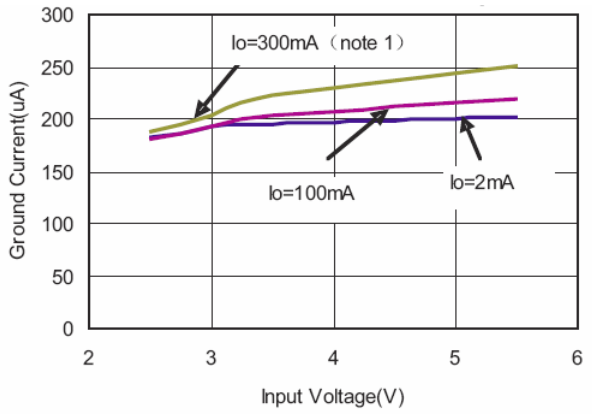




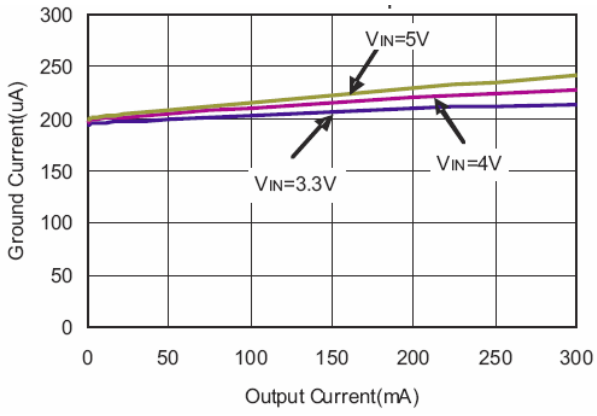
■ TYPICAL PERFORMANCE CHARACTERISTICS（CONTINUED）

(C_{IN} = 2.2uF, C_O = 2.2uF, T_A = 25°C unless otherwise specified.)

Ground Current vs Input Voltage

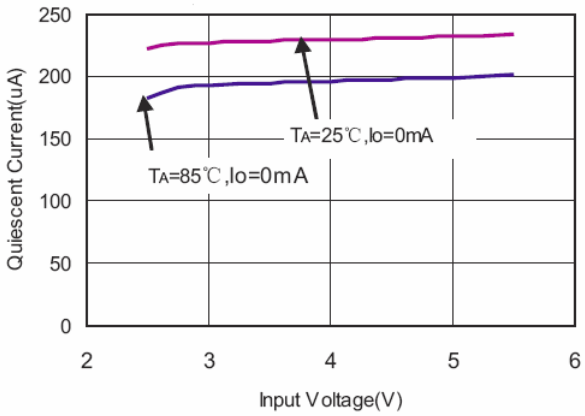


Ground Current vs Output Current

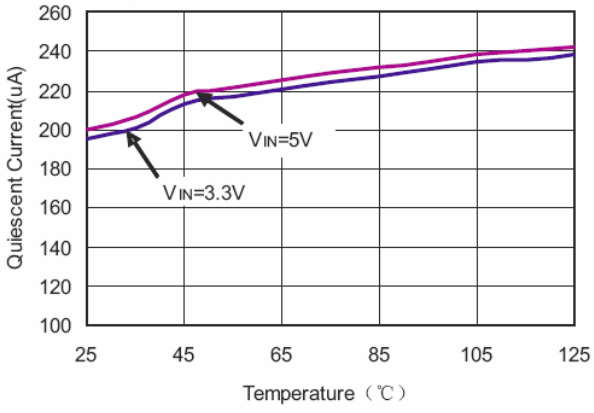


note 1: 2 channels total output current

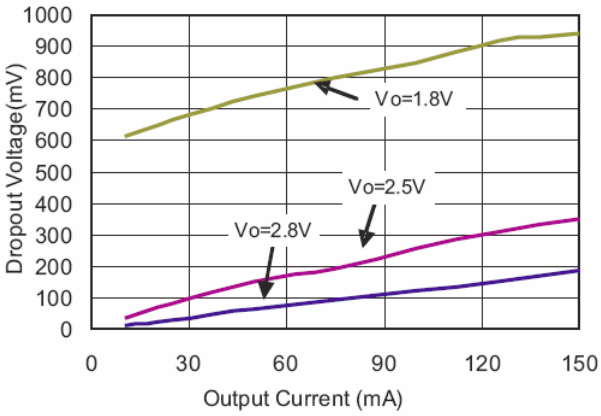
Quiescent Current vs Input Voltage



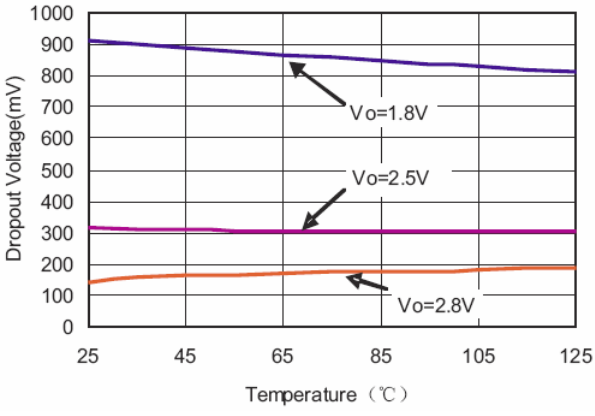
Quiescent Current vs Temperature



Dropout Voltage vs Output Current



Dropout Voltage vs Temperature

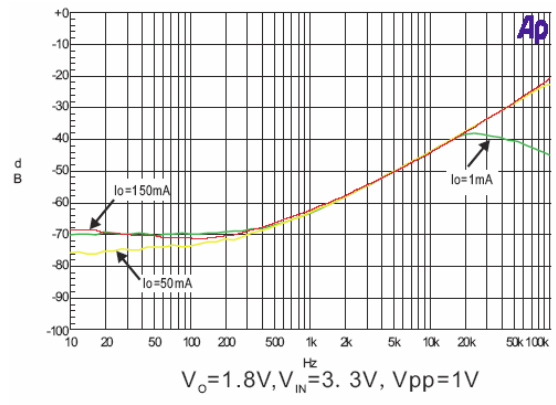


Io=150mA

■ TYPICAL PERFORMANCE CHARACTERISTICS（CONTINUED）

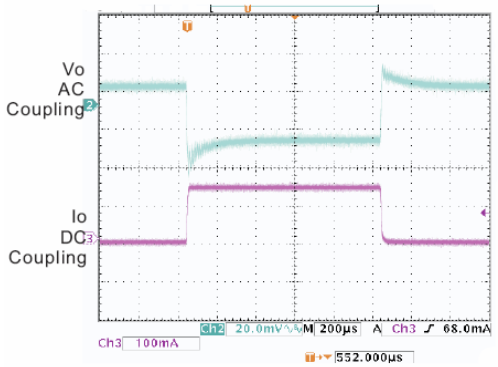
(C_{IN} = 2.2uF, C_O = 2.2uF, T_A = 25°C unless otherwise specified.)

Power Supply Ripple Rejection

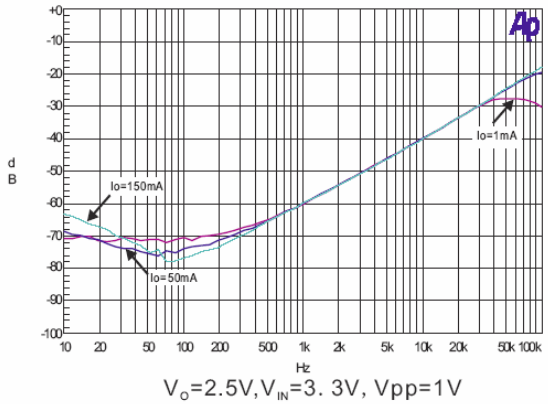


V_O=1.8V,V_{IN}=3. 3V, Vpp=1V

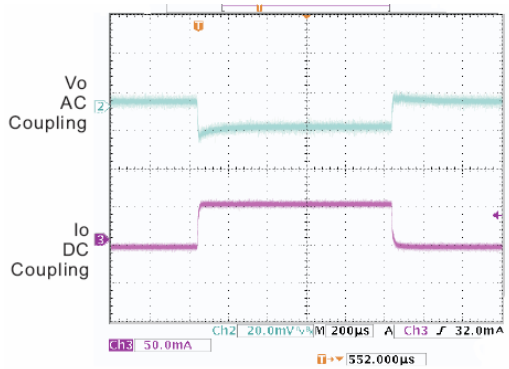
Load Transient Response



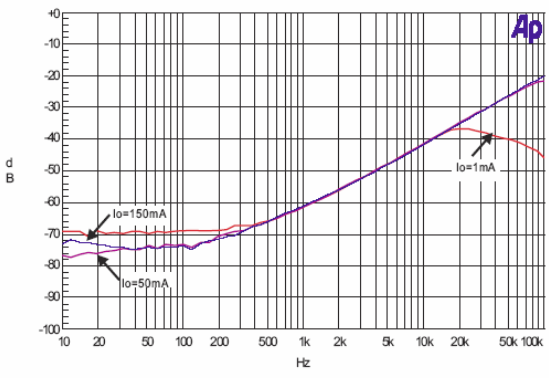
V_{IN}=4.0V, V_O=2.8V,I_O=1mA to 150mA



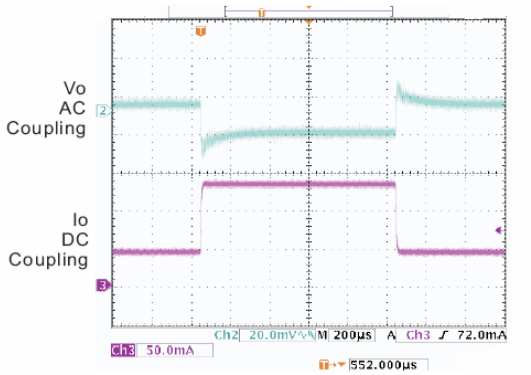
V_O=2.5V,V_{IN}=3. 3V, Vpp=1V



V_{IN}=4.0V, V_O=2.8V,I_O=1mA to 50mA



V_O=2.8V,V_{IN}=3. 3V, Vpp=1V

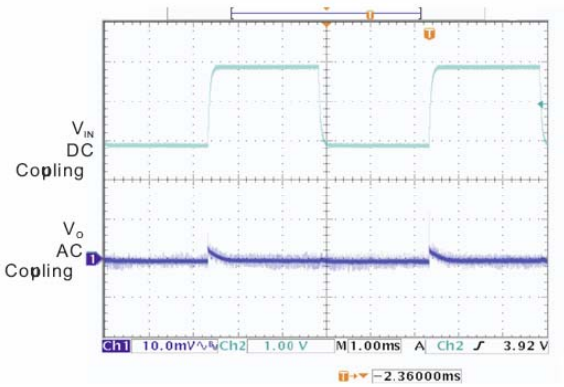


V_{IN}=4.0V, V_O=2.8V,I_O=50mA to 150mA

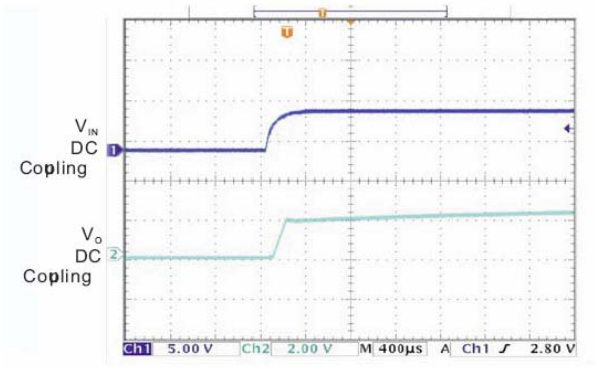
■ TYPICAL PERFORMANCE CHARACTERISTICS（CONTINUED）

(C_{IN} = 2.2uF, C_O = 2.2uF, T_A = 25°C unless otherwise specified.)

Line Transient Response



Turn-on Response

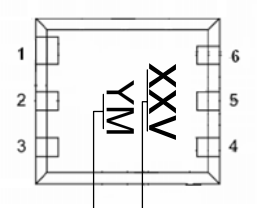


■ ORDERING INFORMATION

FSP2151XXXX

Package:	Output Voltage:	Packing:	Temperature Grade:
U: USP6	(Out 1, Out 2) A: 1.8V, 2.8V B: 1.8V, 2.5V	A: Tape & Reel	D: -40~85℃

■ MARKING INFORMATION



XX: Product code
V: Output voltage
(Out1; Out2)
A: 1.8V; 2.8V
B: 1.8V; 2.5V

Date code:
Y: Year (1=2001)
M: Month (1~9, O, N, D)

■ PACKAGE INFORMATION